Open Society Foundations - Armenia

# Equity in secondary schooling outcomes in Armenia: Evidence from a national survey

Report

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*Analysis of the work reflects the views of the authors and may not coincide with the position and views of the Open Society Foundations - Armenia.*

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# Introduction

This report is part of a larger project involving two studies examining equity in schooling outcomes in Armenia. The first study used data from IEA's Trends in International Mathematics and Science Study (TIMSS) 2003, 2011 and 2015 to analyze equity in student achievement of secondary school students in Armenia, how it changed over time, and how it compared to other countries in the region. The results showed that inequalities in student achievement related to family socio-economic status (SES) increased from 2003 to 2015; that inequalities were largely explained by differences in family SES and to a lesser extent by differences in the school SES composition; and that gaps between schools in urban and rural areas are significant and partly explained by the student and school SES (Caro & He, 2018). Together with evidence reported in previous studies and official statistics, the findings of the first report point to sizable and widening inequalities in student outcomes that require the attention of policy-makers (Chmielewski, 2017; OSF, 2017).

The second study presented in this report draws on the theoretical and methodological framework introduced in the first report to delve deeper into the study of equity. It uses survey data collected in a sociological study commissioned by the Open Society Foundation - Armenia in 2017 to examine family SES and school effects on different student outcomes, including students' school grades, absenteeism, and post-secondary education aspirations. The following research questions are addressed:

1. What is the relationship between SES and student outcomes?
2. Does the school SES play a role in student outcomes above and beyond the role of family SES? Or, in other words, are low SES students in double jeopardy for coming from low SES backgrounds and attending low SES schools?
3. What is the gap in student outcomes between urban and rural areas?
4. Is the urban/rural gap explained by the SES composition of the school student intake?
5. Is the student SES gap in student outcomes explained by private tutoring?
6. Is the school SES gap in student outcomes explained by the quality of school resources?
7. Is the school SES gap in student outcomes explained by the quality of teaching?
8. Does the student SES gap vary depending on how inclusive schools are?
9. Does the student SES gap vary for the level of pedagogical experience of teachers?

The theoretical background for postulating research questions related to the association between student outcomes and family SES was presented in the first report (Caro & He, 2018). Additionally, a brief review of literature to support the expected associations regarding private tutoring, teaching quality, and school inclusiveness is presented here.

Tutoring after school features a significant amount of time use for many students (e.g., Bae & Wickrama, 2014), and is expected to help turn academic failure into academic success (e.g., Hock, Pulvers, Deshler, & Schumaker, 2001). Dietrichson, Bøg, Filges, and Jørgensen (2017) in their

systematic review and meta-analysis of academic interventions for students from low SES background suggested that tutoring contributes to close the SES gap in achievement. Meanwhile, private tutoring is closely related to family financial resources and parental expectation on students (Hao & Yeung, 2015) and, in turn, limited access to private tutoring and low academic expectation may put low SES students at more risk.

Teaching quality plays an important role in closing the student outcome gap in various ways (e.g., Darling-Hammond,2014, Rockoff, 2004). Teaching quality may moderate and mediate the SES and student outcome relationship. For example, findings from Caro, Lenkeit, and Kyriakides (2016) suggest that different teaching practices affect differently low and high SES students. Especially in developing countries such as Armenia, it is expected that school and teacher qualities are malleable factors to improve student learning and contribute to more equitable schooling (Heyneman & Loxley, 1983).

Inclusiveness, one of the key school climate indicators, is believed to be conducive for better learning, not only for students of disadvantaged background, but also for their counterparts (e.g., Kalambouka, Farrell,Dyson, & Kaplan, 2007).

# Data

The data was sourced from questionnaires administered to parents and secondary school students in Armenia in 2017 (OSF, 2017). These two questionnaires were part of a larger sociological study that included separate questionnaires for teachers and university students in addition to focus group discussions. The analysis for the above listed research questions required access to data on family SES, school quality, and student outcomes available in the parental and student questionnaire.

## Sample

A multistage cluster stratified sampling strategy was employed (OSF, 2017). In the first stage, five schools were sampled in each region and in Yerevan, as follows: one basic school in a regional center, one high school in the regional center, one basic school in another town or village in the region, and one secondary school in a town or village. In the second stage, 14 parents were selected randomly within each school. Parents filled out a parental questionnaire with questions pertaining to each and every child who, at the time of the survey, was attending primary and secondary school. Meanwhile, students attending secondary schools (Grade 5 to 12) were randomly sampled in schools and they filled out the student questionnaire, which featured some overlapping items with the parental questionnaire. Student and parent data could not be linked at individual level, but could be linked at school level, based on the school names in the datasets.

Two separate samples were considered for the analysis. Sample 1 consisted of student outcomes and family SES reported by parents and aggregated school-level data (e.g., school and teaching qualities, inclusiveness) reported by students. Schools with fewer than 10 students were excluded to avoid unreliable aggregated school-level data. The final sample contained reports on 1093 students in 55

schools. Sample 2 consisted of student outcomes and family SES reported by students and aggregated school-level data (e.g., school and teaching qualities, inclusiveness, and school SES) reported by parents. The sample consisted 598 secondary school students in 55 schools.

The two samples varied according to the expected reliability of responses from students and parents for the different scales (see Table 1).

Table 1. Analytic samples and survey instruments

| Variables | Sample 1 | Sample 2 |
|---|---|---|
| Student outcomes | Parental questionnaire | Student questionnaire |
| Family SES | Parental questionnaire | Student questionnaire |
| School SES | Parental questionnaire | Parental questionnaire |
| School variables | Student questionnaire | Parental questionnaire |

Family SES is more reliably reported by parents than by students (e.g., Kayser & Summers, 1973; Kreuter, Eckman, Maaz, & Watermann, 2010). Parents are regarded as the main authority for reporting SES. Reports from children on parental occupations, parental education, and home possessions are typically less reliable, especially in the early grades. Thus, generally SES was expected to be more reliable when reported by parents (i.e., Sample 1), but the SES measure reported by students in Grade 5 to 12 (i.e., Sample 2) is likely to be less affected by reliability issues compared to report of students in earlier grades.

Student outcomes and school quality measures are more reliably reported by students (e.g., De Jong & Westerhof, 2001; Scherer & Gustafsson, 2015). Particularly, teaching practices in the classroom are more reliably reported by students than parents (i.e. Sample 1). Especially in secondary schools, students are regarded as expert raters for evaluating teaching practices, as they are able to distinguish between different models of teaching. The use of two samples contributed to mitigating issues related to poor reliability in student and parent reports and adding to the robustness of findings.

# Variables

The following variables reported by parents and students were considered in the analysis.

## Student outcomes

### Parent and student questionnaire

- Student absenteeism (ABSENT): Number of days the student was absent in the last month.

- Student grades (GRADES): Academic performance of student in school (1= marks of 5, 4, 3, 2, 1, and 0; 2= marks of 7 and 6 5; 3= Marks of 8, 4= marks of 9; 5= marks of 10).
- Student post-secondary aspirations (POSTSEC): The student plans to continue education after graduating from school (1= yes, 0= no).

## Family background variables

### Parent questionnaire

- Mother's education (MOMED): The highest level of education attained by the mother (1= below secondary education; 2= secondary education, 3= vocational education, and 4= higher education).
- Father's education (DADED): The highest level of education attained by the father (1= below secondary education; 2= secondary education, 3= vocational education, and 4= higher education).
- Family income (INCOME): Family average monthly income during the last year in Armenian drams.
- Family expenditure (EXPEND): Family average monthly expenditure during the last year in Armenian drams.

### Parent and student questionnaire

- Self-perceived finances (FINAN): Self-perceived family financial security level (1= not secure at all, 2= rather insecure, 3= rather secure, 4 = completely secure).
- Computers at home (COMP): Number of computers at home.
- Internet at home (INTER): Availability of Internet at home (1= yes, 0= no).
- Private tutoring (TUTOR): Parents and student reported whether the child/oneself gets private tutoring (1= yes, 0= no).

## School quality variables

### Parent and student questionnaire

- School quality (SCQUAL): Parents and students rated the following aspects of the school (1=very bad, 2= bad, 3= normal/satisfactory, 4= good, 5= very good): (1) condition of the buildings, (2) property/furniture, (3) education quality, (4) discipline, (5) financial management skills of the principal, (6) human resource policy of the principal, (7) external policy of the principal (relations with the Marz governor, village mayor), (8) work of the administrative staff, (9) activities of the school's governing board, (10) activities of the parent council, and (11) activities of the student council. Original option categories in the questionnaire (1=very good to 5=very bad; see Appendix A) were reversed for scale development (see Scale Development section).

- Inclusiveness of school (INCLUSIVE): Responses to three items on the extent to which the school perform the following functions were indicative of the inclusiveness of school (1=generally does not perform, 2=does not do it enough, 3=rather performs, 4=completely). These items include: (1) provides equal opportunities for all children, (2) teaches to respect human rights, and (3) helps get rid of stereotypes.
- Teaching quality (TEAQUAL): Parents and students rated the following aspects of teachers (1=very bad, 2= bad, 3= normal/satisfactory, 4= good, 5= very good): (1) subject knowledge, (2) pedagogical skills, and (3) equal treatment of students. Original option categories in the questionnaire (1=very good to 5=very bad; see Appendix A) were reversed for scale development (see Scale Development section).

Descriptive statistics for variables considered in the analysis are presented in Appendix A for Sample 1 and Sample 2.

# Scale development

In addition to single variables, composite scales were developed to more validly analyze the relationship family and school characteristics and student outcomes.

## Family SES

A family SES scale was developed drawing on previous methodologies with data from Armenia (Caro & He, 2018) and international benchmarks (Caro & Cortés, 2012). Family SES items were combined into a single scale using principal component analysis (PCA). The PCA technique handled missing data in SES constituent items using the R package 'pcaMethods' (Stacklies, Redestig, Scholz, Walther & Selbig, 2007). The following describes the development of the SES scale for Sample 1 based on responses from parents. Given the fewer items and the difficulty for students to estimate family financial wellbeing, SES was less reliably measured with student responses in Sample 2. Scale development with student responses is presented in Appendix B.

Traditional PCA on SES observed items, where missing values resulted in list-wise deletion, was performed for comparison. The SES measure correlated 0.99 with the traditional PCA SES measure. PCA factor loadings are reported in Table 2.

Table 2. SES factor loadings from Parental reports

| SES items | Loading |
|---|---|
| Mother's education (MOMED) | 0.44 |
| Father's education (DADED) | 0.40 |
| Family monthly income (INCOME) | 0.28 |
| Family monthly expenditure (EXPEND) | 0.26 |

| | |
|---|---|
| Number of computers at home (COMP) | 0.43 |
| Availability of Internet at home (INTER) | 0.41 |
| Self-perceived financial security (FINAN) | 0.38 |

## SES and poverty

Figure 1 displays the SES distribution in the total sample. Recent figures indicate that around 30% of the Armenian population lives below the poverty line (see, for example, World Bank and Central Intelligence Agency). Consistently, a vertical dashed line has been drawn to indicate the 30th percentile in the SES distribution. With that, the derived SES measure and poverty statistics can be related. Particularly, one can assume that families below the 30th percentile are living in poverty and families above the 30th percentile are not.

Figure 1. SES distribution and poverty line

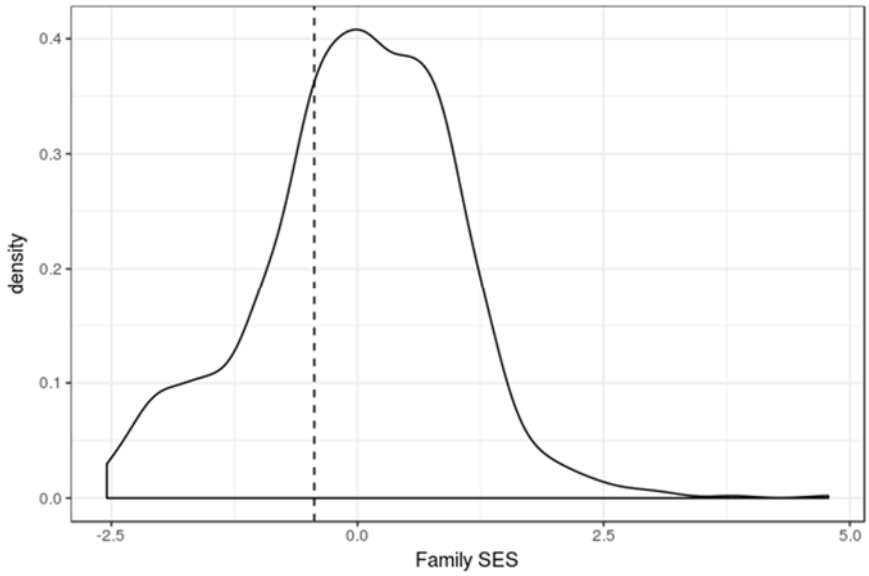



Figure 2 and 3 display the SES distribution by region and province, respectively. The dashed vertical line indicates the SES poverty line of 30%.

Figure 2. SES distribution by region

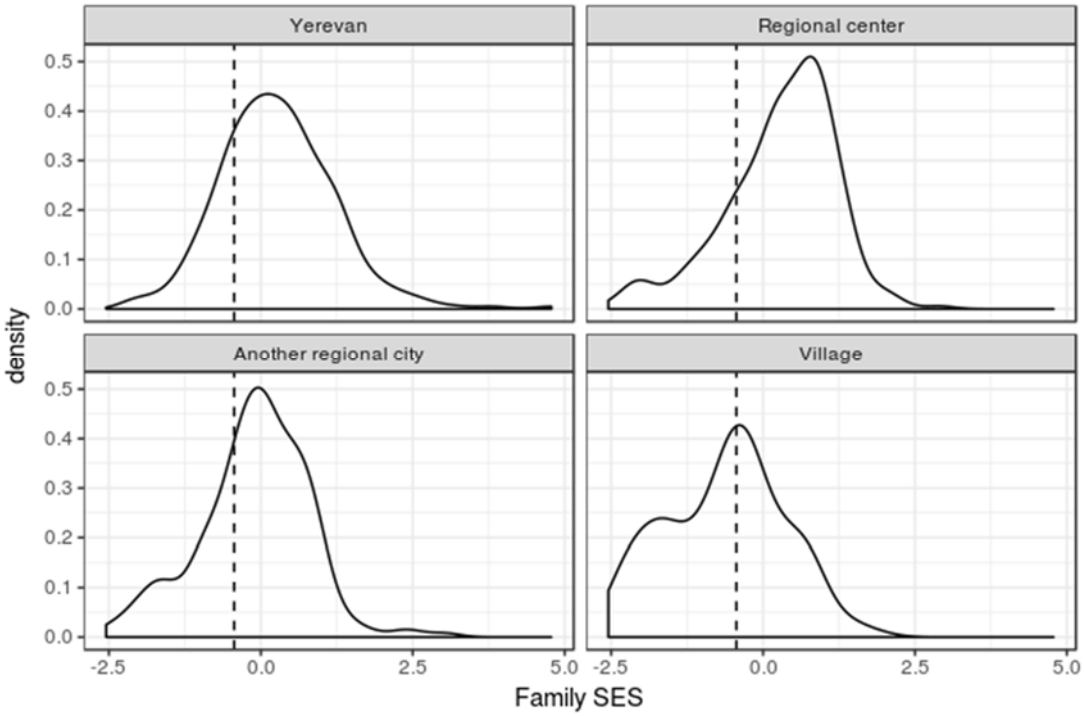
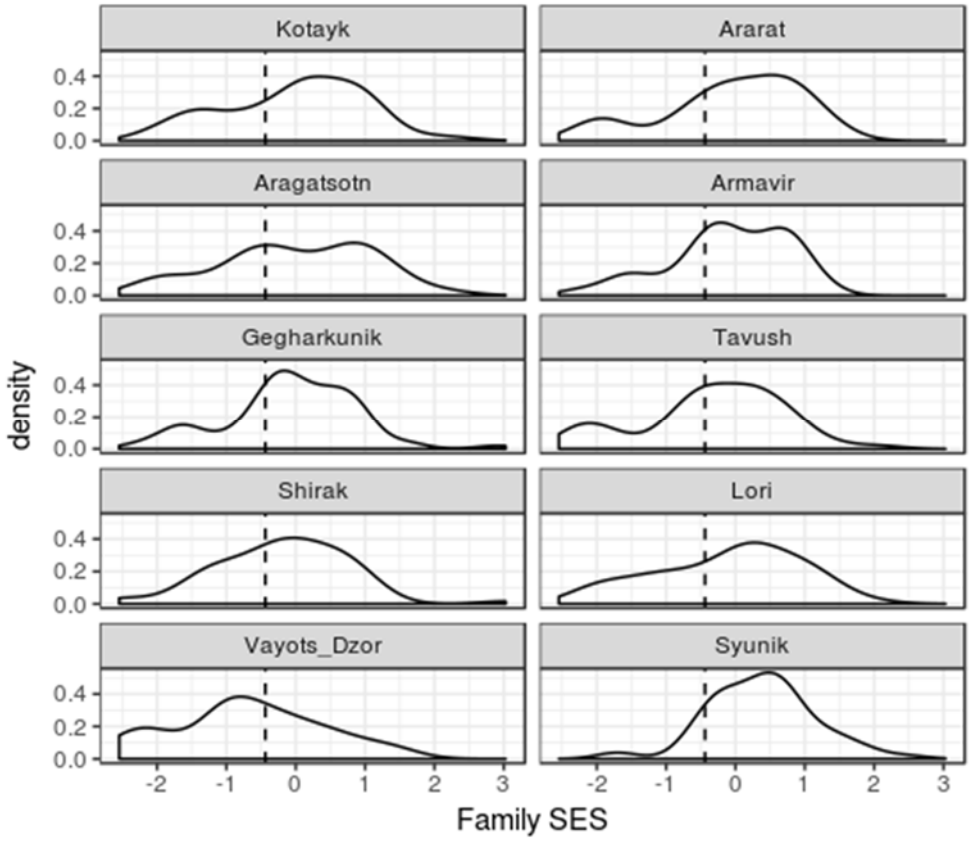



Figure 3. SES distribution by province




The following tables describe the socio-economic characteristics of families living in poverty and not living in poverty. Parents were classified as poor and non-poor according to the SES poverty line (30th percentile).

Table 3 records the percentage of parents according to highest level of education attained and SES poverty status. Mothers and fathers from poor families had obtained lower levels of education compared to their peers from non-poor families. More than 70% of parents in poor families attained a maximum level of secondary education, whereas 25% or less parents had attained a maximum level of secondary education in non-poor families. The great majority of parents in non-poor families (75% or more) had attained vocational education or higher education.

Table 3. SES poverty and parental education: % of parents by highest level of education and poverty status

| Highest level of education | Mother's education (MOMED) | | Father's education (DADED) | |
|---|---|---|---|---|
| | Non-poor | Poor | Non-poor | Poor |
| Below secondary education | 0.15% | 2.85% | 0.64% | 6.64% |
| Secondary education | 17.61% | 76.51% | 25.16% | 73.44% |
| Vocational education | 32.92% | 16.01% | 25.16% | 16.41% |
| Higher education | 49.31% | 4.63% | 49.04% | 3.52% |
| Total | 100% | 100% | 100% | 100% |

Table 4 presents the percentage of parents by self-perceived levels of financial security and poverty status. As expected, poor families tended also to perceive lower levels of financial security: around 70% of families felt financially insecure. On the other hand, around 80% of non-poor parents felt financially secure.

Table 4. Self-perceived financial security (FINAN) and poverty (% of parents)

| Financial security | Non-poor | Poor |
|---|---|---|
| Not secure at all | 1.33% | 19.44% |
| Rather insecure | 18.22% | 49.65% |
| Rather secure | 74.22% | 30.56% |
| Completely secure | 6.22% | 0.35% |
| Total | 100.00% | 100.00% |

Table 5 presents average income and expenditure levels by poverty status. Consistent with previous results, average income and expenditure levels were also higher for non-poor families than for poor families.

Table 5. Average income and expenditure levels in Armenian drams by poverty status

| Poverty status | Family income (INCOME) | Family expenditure (EXPEND) |
|---|---|---|
| Non-poor | 299,803 | 311,962 |
| Poor | 105,459 | 132,470 |

Access to computers and Internet at home also varied markedly among poor and non-poor families. Virtually all non-poor families had at least one computer and Internet at home (98%), whereas 38% of families living in poverty did not have a computer at home and 53% did not have access to Internet.

## School quality

Parents and students rated school quality with responses to 11 question items (SCQUAL). For both samples, school quality items grouped together in three factors labelled as 'management', 'participation', and 'infrastructure. The factor solution for parent reports (source of Sample 2) is presented in Table 6A, and student reports (source of Sample 1) is presented in Table 6B.

Table 6A. Parental report of school quality items: Exploratory factor analysis (factor loadings)

| Parental reports | Management | Participation | Infrastructure |
|---|---|---|---|
| (1) Condition of the buildings | 0.18 | 0.09 | **0.82** |
| (2) Property/furniture | 0.19 | 0.17 | **0.94** |
| (3) Education quality | 0.57 | 0.38 | 0.36 |
| (4) Discipline | 0.58 | 0.33 | 0.36 |
| (5) Financial management skills of the principal | **0.80** | 0.36 | 0.22 |
| (6) Human resource policy of the principal | **0.85** | 0.34 | 0.18 |
| (7) External policy of the principal | **0.84** | 0.24 | 0.18 |
| (8) Work of the administrative staff | 0.74 | 0.41 | 0.20 |

| | | | |
|---|---|---|---|
| (9) Activities of the school's governing board | 0.67 | 0.54 | 0.16 |
| (10) Activities of the parent council | 0.47 | **0.84** | 0.17 |
| (11) Activities of the student council | 0.51 | **0.63** | 0.20 |

Note: The two strongest loadings for each factor are in bold.

Table 6B. Student report of school quality items: Exploratory factor analysis (factor loadings)

| | Management | Infrastructure | Participation |
|---|---|---|---|
| (1) Condition of the buildings | 0.35 | **0.94** | 0.28 |
| (2) Property/furniture | 0.37 | **0.95** | 0.36 |
| (3) Education quality | 0.60 | 0.46 | 0.52 |
| (4) Discipline | 0.65 | 0.34 | 0.31 |
| (5) Financial management skills of the principal | **0.78** | 0.26 | 0.38 |
| (7) External policy of the principal | **0.80** | 0.25 | 0.27 |
| (8) Work of the administrative staff | **0.73** | 0.35 | 0.43 |
| (9) Activities of the school's governing board | 0.68 | 0.29 | 0.63 |
| (10) Activities of the parent council | 0.39 | 0.34 | **0.85** |
| (11) Activities of the student council | 0.38 | 0.28 | **0.86** |

Note: The strongest loadings for each factor are in bold.

Details of exploratory factor analysis for Sample 1 and 2 are presented in Appendix B.

## School inclusiveness

Responses to the three school inclusiveness-related items were subjected to a PCA based on the parental and student data respectively. All three items loaded positively on one factor, which explained 73% of the variance in the parental data and 64% of the variance in the student data. The factor loadings are presented in the Table 7. Factor scores from this analysis were extracted to indicate inclusiveness of school.

Table 7. School inclusiveness: PCA (loadings)

| Item content | Loadings (Parents) | Loadings (Students) |
|---|---|---|
| (1) Provides equal opportunities for all children | 0.80 | 0.75 |
| (2) Teaches to respect human rights | 0.89 | 0.83 |
| (3) Helps get rid of stereotypes | 0.87 | 0.82 |

## Teaching quality

Teaching quality was measured with 3 question items (TEAQUAL). Items were summarized into a single scale using PCA. The PCA solution is presented in Table 8.

Table 8. Teaching quality items (TEAQUAL): PCA factor loadings

| | Loadings (Parents) | Loadings (Students) |
|---|---|---|
| (1) Subject knowledge | 0.58 | 0.86 |
| (2) Pedagogical skills | 0.60 | 0.87 |
| (3) Equal treatment of students | 0.56 | 0.85 |

In the parental data, as expected the loading for equal treatment of students was slightly lower compared to pedagogical skills and subject knowledge. It was, however, still meaningful for determining teaching quality with a value of 0.56. In the student data, all three items were strongly loaded on the factor. The factor scores were extracted to indicate the level of teaching quality in each dataset.

# Statistical analysis

As described earlier, both Sample 1 and Sample 2 had a multilevel structure consisting of parents and students nested in schools, respectively. Accordingly, the analysis was conducted using multilevel regression models that took into account the nested structure of the data. The student outcomes of school grades and student absenteeism were analyzed with multilevel linear regressions. The post-secondary education binary outcome was analyzed with multilevel logistic regressions.

Student level covariates were centered around the school mean. School level covariates were centered around the grand mean (Enders & Tofighi, 2007). Thus, student level coefficients reflect pure-within school effects and school level coefficients pure between-school effects.

# Results

1. What is the relationship between SES and student outcomes?

The relationship between family SES and student outcomes was examined using multilevel models. Family SES was centered around the school mean SES. Thus, SES coefficients can be interpreted as pure-within school effects. Results are presented in Table 9.

Table 9. Regression of student outcomes on family SES

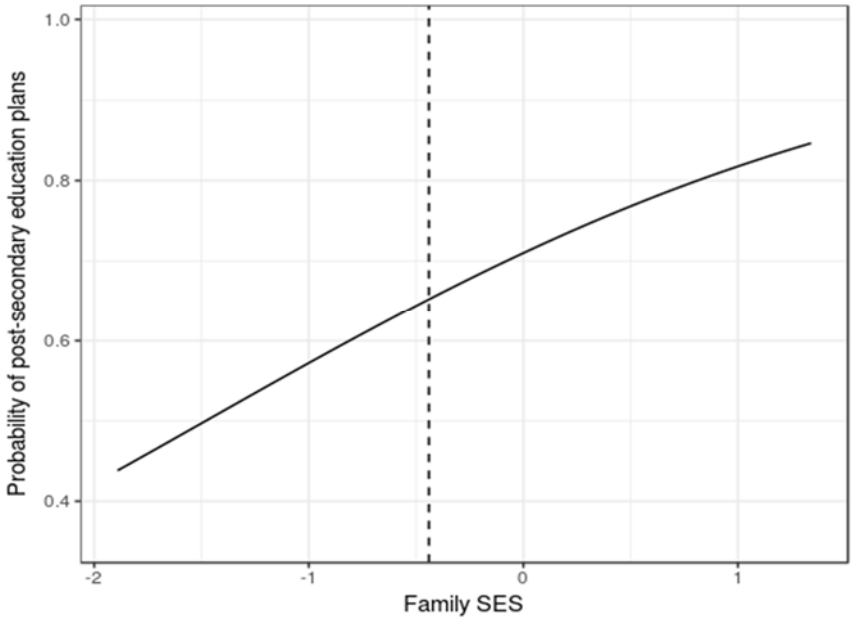
| Data source | Predictors | GRADES | ABSENT | POSTSEC (odds ratio) |
|---|---|---|---|---|
| Sample 1 | Family SES | **.206** | -.085 | **1.831** |
| Sample 2 | Family SES | **.154** | .198 | **1.977** |

Note. Estimates in bold are statistically significant ($p < 0.05$).

Family SES was positively related to student grades and post-secondary aspirations plans. No association was found between family SES and student absenteeism. The results are consistent across the data reported by parents (Sample 1) and students (Sample 2).

The probability of pursuing post-secondary education plans can be estimated from results of multilevel logistic regression presented in Table 9. Figure 4 illustrates the association between family SES and the probability of pursuing post-secondary education plans from Sample 1. A dashed vertical line has been drawn to distinguish poor from non-poor families. Outliers have been removed: 5% of the sample with lowest and highest SES scores.

Figure 4. Probability of pursuing post-secondary education and family SES




The probability of pursuing post-secondary education plans is clearly lower among students living in poverty compared to the rest. On average, around 55% of students from poor families plan to pursue post-secondary education, compared to 75% of students in non-poor families. The probability increases steadily across the range of SES. We decided to further explore the association between SES and students educational aspirations. Particularly, we evaluated if the association with family SES persisted once students grades were controlled for. Results are presented in Table 10.

Table 10. Regression of student post-secondary education plans on student grades and student SES.

| Data Source | Predictors | ABSENT (odds ratio) |
|---|---|---|
| Sample 1 | GRADES | **1.469** |
| | Family SES | **1.776** |
| Sample 2 | GRADES | **3.851** |
| | Family SES | **1.649** |

Note. Estimates in bold are statistically significant ($p < 0.05$).

The results show that independently of student grades, family SES continues to be positively associated with student aspirations to pursue post-secondary education in Sample 1 and Sample 2.

2. Does the school SES play a role in student outcomes above and beyond the role of family SES? Or, in other words, are low SES students in double jeopardy for coming from low SES backgrounds and attending low SES schools?

The research question is analyzed with multilevel models of the relationship between student outcomes, family SES, and school SES. Family SES was centered around the school mean SES. Thus, family SES and school SES are orthogonal and coefficients of family SES reflect pure-within school effects and coefficients of school SES capture pure between-school effects. School SES composition effects are captured by the difference between school SES and family SES effects. Technical details for deriving student, school, and composition SES effects are provided in the first report (Caro & He, 2018). Results are presented in Table 11.

Table 11. Regression of student outcomes on family and school SES

| Data Source | Predictors | GRADES | ABSENT | POSTSEC (odds ratio) |
|---|---|---|---|---|
| Sample 1 | Family SES | **.206** | -.085 | **1.833** |
| | School SES | **.242** | .189 | **1.970** |
| Sample 2 | Family SES | **.154** | .198 | **2.032** |

| | | | | |
|---|---|---|---|---|
| | School SES | **.251** | .116 | .597 |

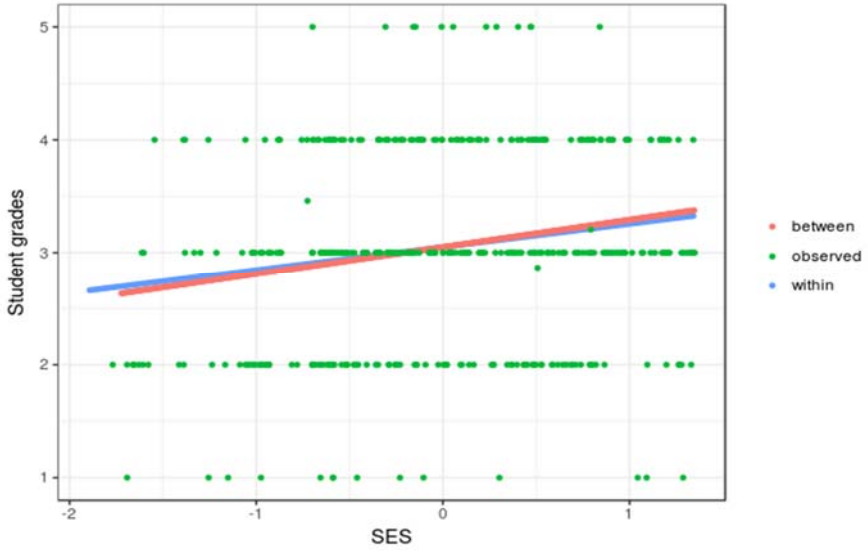
Note. Estimates in bold are statistically significant ($p < 0.05$).

Family and school SES are positively related to student grades and post-secondary education aspirations. The difference between school and family SES coefficients is relatively small. Thus, there is no strong evidence that the school SES plays a role in student outcomes in addition to family SES. Or, in other words, the school SES gap in students outcomes is mainly explained by family SES differences between students and not additionally by school SES composition effects.

Figure 5 displays for Sample 1 the association between student grades and the student (within school) and school (between school) SES. Observed data points for a random sample of 500 students have been plotted. Outliers have been removed: 5% of the sample with lowest and highest SES scores.

The school and student SES lines are virtually parallel consistent with coefficient sizes (see Table 11). There is no evidence for a double jeopardy effect. Further, there is significant variability in student grades for comparable SES levels. Thus, despite a positive relationship between student grades and SES, the relationship is clearly not deterministic, and low and high student grades are observed for both low and high SES students. There are thus other factors beyond SES explaining differences in student grades.

Figure 5. Student grades (GRADES) and SES: observed, within school, and between schools associations




3. What is the gap in student outcomes between urban and rural areas?

The research question was evaluated with multilevel regressions of student outcomes on a rural covariate. The rural covariate took the value of 1 in rural areas (i.e., village) and the value of 0 in non-rural areas (i.e., Yerevan, Capital city, and another city) . Table 12 evaluates the gap between rural and non-rural schools in student outcomes.

Table 12. Regression of student outcomes on school location variables

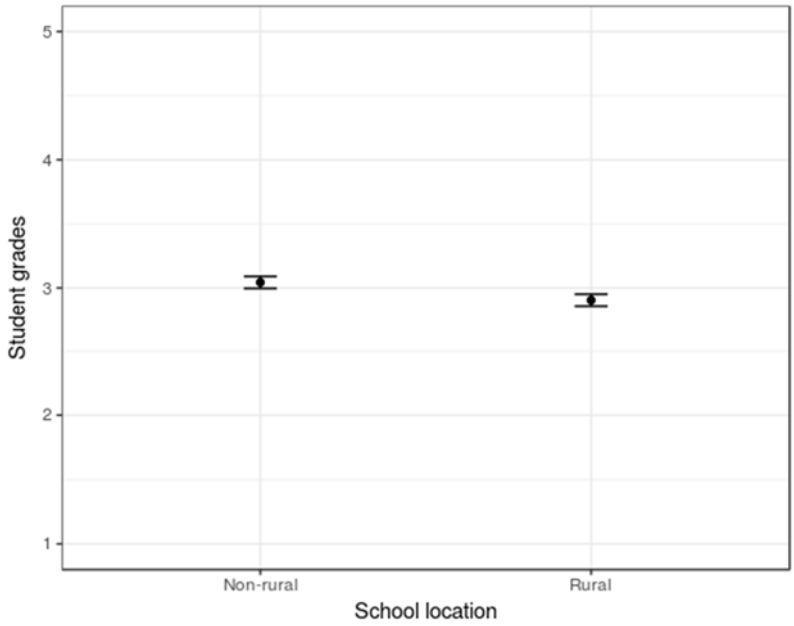
| Data Source | Predictors | GRADES | ABSENT | POSTSEC (odds ratio) |
|---|---|---|---|---|
| Sample 1 | Rural | **-.254** | -.165 | .773 |
| Sample 2 | Rural | **-.262** | -.405 | 1.801 |

Note. Estimates in bold are statistically significant ($p < 0.05$).

Students in rural areas received lower grades than students in non-rural areas. However, no significant differences were observed in terms of absenteeism and post-secondary aspirations among students in rural and non-rural areas.

Figure 6 shows the relationship between school location and student grades according to responses of parents (Sample 1). Students in rural areas performed slightly lower than students in non-rural areas.

Figure 6. Student grades and school location




4. Is the urban/rural gap explained by the SES composition of the school student intake?

A gap between rural and non-rural schools was observed for student grades. Table 13 evaluates whether the gap was explained by SES.

Table 13. Regression of student outcomes on school location and SES

| Data Source | Predictors | GRADES | ABSENT | POSTSEC (odds ratio) |
|---|---|---|---|---|
| Sample 1 | Rural | -.116 | -.053 | 1.371 |
| | Family SES | **.205** | -.085 | **1.841** |
| | School SES | **.188** | .162 | **2.297** |
| Sample 2 | Rural | -.124 | .197 | 1.452 |
| | Family SES | **.153** | -.114 | **-2.031** |
| | School SES | .192 | -.483 | .705 |

Note. Estimates in bold are statistically significant ($p < 0.05$).

The results indicate that the gap in students grades and post-secondary school aspirations is fully explained by the school SES. Family SES was centered around the school SES mean and is therefore uncorrelated with the rural covariate.

5. Is the student SES gap in student outcomes explained by private tutoring?

Two model specifications were considered in order to evaluate this research question. First, private tutoring was regressed on family SES in a logistic regression within the multilevel structured data to check whether family SES had an impact on the probability of private tutoring. For Sample 1, this was indeed the case ($\exp(B) = 1.723$, $p < .001$). That is, students with one unit higher SES were 1.723 times more likely to have private tutoring compared with students with one unit lower SES. The same was observed for Sample 2, ($\exp(B) = 1.496$, $p < .001$), that is, students from higher SES families were more likely to have private tutoring compared with their counterparts in lower SES families.

Secondly, the three outcome variables were regressed on family SES and private tutoring, respectively. Regression coefficients are reported in the Table 14.

Table 14. Regression of student outcomes on family SES and private tutoring

| Data Source | Predictors | GRADES | ABSENT | POSTSEC (odds ratio) |
|---|---|---|---|---|
| Sample 1 | Family SES | **.184** | -.092 | **1.685** |

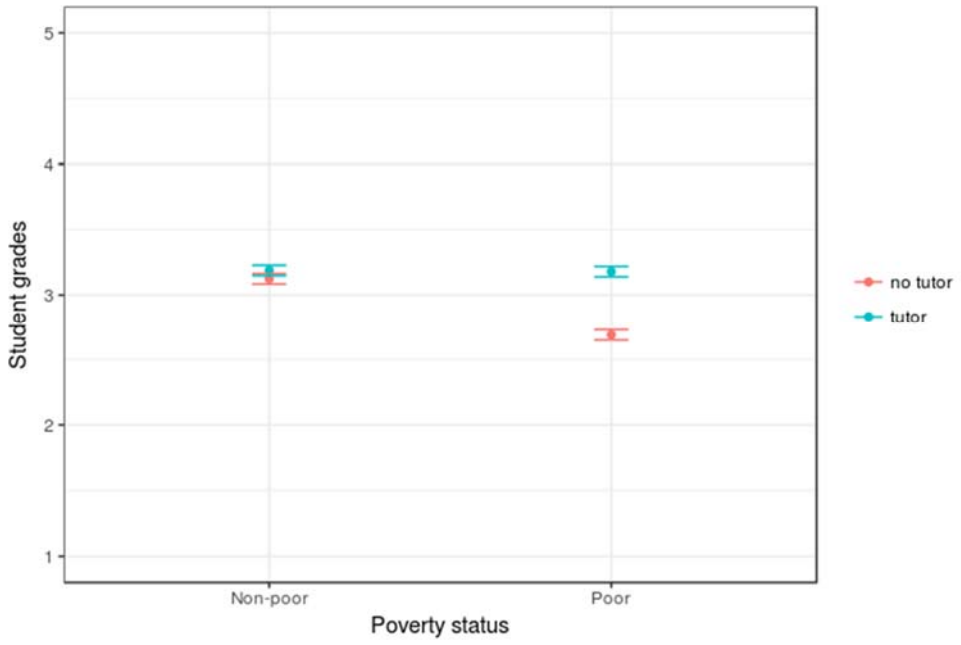
| | | | | |
|---|---|---|---|---|
| | Private Tutoring | **.238** | .078 | **3.092** |
| Sample 2 | Family SES | **.139** | .200 | **1.818** |
| | Private Tutoring | **.185** | -.022 | **5.066** |

Note. Estimates in bold are statistically significant ($p < 0.05$).

Family SES coefficients reduced slightly from Table 9 to Table 14, for example, less than 10% for student grades in Sample 1. There is therefore weak evidence that the SES gap is explained indirectly by private tutoring. Instead, the evidence pointed to a direct association between private tutoring and student grades and post-secondary school aspirations that was independent of the family SES. The association between private tutoring and post-secondary school aspirations was particularly strong.

Figure 7 displays the relationship between student grades and poverty status for students with and without private tutors in Sample 1. The results suggest that private tutoring is particularly advantageous for students living in poor families. The gap in student grades for students with and without private tutoring is smaller for students coming from non-poor families.

Figure 7. Student grades, poverty status, and private tutoring




6. Is the school SES gap in student outcomes explained by the quality of school resources?

The research question was evaluated with multilevel regressions of the relationship between student outcomes and school quality scales while controlling for SES. Results are reported in Table 15.

Table 15. Regression of student outcomes on SES and school quality factors

| Data Source | Predictors | GRADES | ABSENT | POSTSEC (odds ratio) |
|---|---|---|---|---|
| Sample 1 | Family SES | **.206** | -.085 | **1.842** |
| | School SES | **.221** | .245 | **1.835** |
| | School Infrastructure | **.122** | -.276 | 1.410 |
| | School Management | **.286** | -.297 | .868 |
| | School Participation | **.283** | -.273 | 1.122 |
| Sample 2 | Family SES | **.154** | .198 | **2.041** |
| | School SES | **.227** | .082 | .565 |
| | School Infrastructure | **.143** | -.028 | 1.144 |
| | School Management | **.251** | -.560 | 1.855 |
| | School Participation | **.234** | -.440 | .409 |

Note. Estimates in bold are statistically significant ($p < 0.05$).

The results indicate that school infrastructure, school management and school participation are positively related to student grades independently of SES. The school SES coefficient reduced only slightly from Table 11 to Table 15 providing no strong support for a explanatory or mediating role of school quality on school SES gaps. Instead the results pointed to a direct association between student grades and school quality variables. There was no evidence that school quality factors were related to student absenteeism and post-secondary education plans once SES was controlled for. Results are consistent across school quality data reported by students (Sample 1) and parents (Sample 2).

7. Is the school SES gap in student outcomes explained by the quality of teaching?

Table 16 evaluated whether school SES gaps were partly explained by the quality of teaching. As with the previous question on school quality effects, models control for SES to rule out that associations with teaching quality are actually explained by SES.

Table 16. Regression of student outcomes on SES and teaching quality

| Data Source | Predictors | GRADES | ABSENT | POSTSEC (odds ratio) |
|---|---|---|---|---|
| 1 | Family SES | **.206** | -.085 | **1.837** |
| | School SES | **.212** | .243 | **2.052** |
| | Teaching quality | **.331** | **-.695** | .619 |
| 2 | Family SES | **.154** | .198 | **2.027** |
| | School SES | **.208** | .168 | .528 |
| | Teaching quality | **.458** | -.720 | 2.221 |

Note. Estimates in bold are statistically significant ($p < 0.05$).

The results are similar to the ones reported for school quality factors. Teaching was positively related to student grades, but not to student absenteeism or post-secondary aspirations. The school SES coefficient did not reduce importantly from Table 11 to Table 16 when teaching quality was added to the model. As such, there was no evidence that teaching quality contributed to explain SES gaps between schools. Instead, the results indicated that teaching quality played a direct role in student outcomes independently of SES.

8. Does the student SES gap vary depending on how inclusive schools are?

Table 17 evaluates whether student outcomes are related to family SES and school inclusiveness and whether school inclusiveness interacts with family SES. Because school level covariates were centered around the grand mean, main effects of school inclusiveness capture the association with school inclusiveness for average family SES.

Table 17. Regression of student outcomes on the interaction between SES and school inclusiveness

| Data Source | Predictors | GRADES | ABSENT | POSTSEC (odds ratio) |
|---|---|---|---|---|
| Sample 1 | Family SES | **.204** | -.082 | **1.829** |
| | School Inclusiveness | **.195** | -.284 | 1.159 |
| | Family SES x School Inclusiveness | .040 | -.060 | 1.051 |
| Sample 2 | Family SES | **.150** | .174 | **1.990** |
| | School Inclusiveness | **.204** | -.278 | 1.260 |
| | Family SES x School Inclusiveness | .049 | .392 | .949 |

Note. Estimates in bold are statistically significant ($p < 0.05$).

The results indicate that school inclusiveness is positively related to student grades independently of family SES. There was no evidence of an interaction between SES and school inclusiveness. Further, there was no evidence of an association between school inclusiveness and student absenteeism and post-secondary education aspirations once SES was controlled for.

9. Does the student SES gap vary for the level of teacher quality?

Table 18 evaluates whether the association with teaching quality varied by SES. Or, in other words, whether teaching quality differently affected students of lower and higher SES backgrounds.

Table 18. Regression of student outcomes on the interaction between SES and teaching quality

| Data Source | Predictors | GRADES | ABSENT | POSTSEC (odds ratio) |
|---|---|---|---|---|
| 1 | Family SES | **.206** | -.101 | **1.829** |
| | Teaching Quality | **.361** | **-.668** | .688 |
| | Family SES x Teaching Quality | -.002 | -.171 | .896 |
| 2 | Family SES | **.161** | .217 | **1.761** |

| | | | | |
|---|---|---|---|---|
| | Teaching Quality | **.486** | -.706 | 1.709 |
| | Family SES x Teaching Quality | .060 | .155 | .620 |

Note. Estimates in bold are statistically significant ($p < 0.05$).

As shown earlier teaching quality was positively related to student grades. The results here provide no evidence of an interaction between teaching quality and SES for explaining student grades.

# Discussion

This study made use of both student and parental reports of student outcomes, family SES, school resources and climate, and teaching quality data to answer a series of research questions regarding equity in secondary schools. Responses of parents and students in two samples lead to largely consistent results, lending robustness to the conclusions. Responses to research questions are discussed below.

1. What is the relationship between SES and student outcomes?

Students from higher SES backgrounds obtain higher grades compared to students from less affluent families. To the extent that grades in our data are class-reference based and not standardized across schools, our results likely underestimate the association between family SES and student achievement. Further, students from low SES families are less likely to pursue post-secondary education compared to high SES students independently of their school grades. That is, given two students with relatively high school grades but from different socio-economic backgrounds, the one from a low SES family is less likely to pursue post-secondary education. This result reflects a severe problem in terms of equity and meritocracy. It suggests that family SES not only affects educational aspirations through its influence on school grades, but that there are additional mechanisms unrelated to schooling outcomes perpetuating the SES gap in education and the reproduction of inequality. Previous research on educational transitions indicates that low SES students with high school grades do not have the necessary information to navigate in the system and the academic support from parents regarding career plans in addition to family income opportunities to access higher education (Caro, Cortina, & Eccles, 2014; Harrington & Sum, 1999). As a result, they are less likely to pursue post-secondary education despite their successful performance in school. Policies directed towards supporting low SES high performing students in the transition from school to post-secondary education, for example, with career guidance, may contribute to reducing the SES gap.

2. Does the school SES play a role in student outcomes above and beyond the role of family SES? Or, in other words, are low SES students in double jeopardy for coming from low SES backgrounds and attending low SES schools?

There was no evidence that students are in double jeopardy. Students in high SES schools tend to perform better in school and are more likely to report post-secondary school aspirations than students in low SES schools, but the gap between schools is mainly explained by differences in family SES and not additionally by school SES composition effects. The results are consistent with most recent TIMSS 2015 data findings in Armenia (Caro and He, 2018). However, evidence in earlier years with TIMSS 2003 and 2011 points to school SES segregation and double jeopardy effects for math achievement. Namely, that given two students with comparable SES levels but attending different schools in terms of SES, the one attending a lower SES school exhibits lower student achievement.

3. What is the gap in student outcomes between urban and rural areas?

Students in rural areas obtain lower grades than students in non-rural areas. The gap in student grades associated to school location was not large. However, again, class-referenced school grades self-reported by students and parents may underestimate gaps related to school location if, for example, teachers in rural areas use a lower standard to evaluate students compared to teachers in urban areas. In fact, results with TIMSS standardized achievement data point to sizable gaps in math and science achievement across schools in urban and rural areas in Armenia (Caro & He, 2018).

4. Is the urban/rural gap explained by the SES composition of the school student intake?

The gap between rural and urban schools in student grades is fully explained by SES. That is, the reason why students in rural areas perform worse than students in urban areas is because they come from lower SES families and attend low SES schools. Once you take into account SES, students in rural and urban areas perform similarly. The results are consistent with Caro and He (2018). Again, they point to the importance of tackling SES disadvantaged, as it seems to be the main driver for inequalities in student performance.

5. Is the student SES gap in student outcomes explained by private tutoring?

There was no evidence that private tutoring contributed to explain the SES gap in student outcomes. Students from high SES families were more likely to hire private tutors than students from low SES families, but private tutoring was not a significant mechanism for explaining the SES gap. Instead, the results suggested that private tutoring was positively and directly related to student grades and post-secondary education plans irrespectively of the students' family background. Private tutoring was particularly advantageous for post-secondary education aspirations and school performance of students living in poverty conditions. The result point to the potential of school support and remedial education for improving schooling outcomes of students coming from poor families (e.g., Hock et al, 2001).

6. Is the school SES gap in student outcomes explained by the quality of school resources?

The school infrastructure, management and participation perceived by parents and students were positively related to student grades independently of the school SES. That is, school quality factors can contribute to improve schooling outcomes in both low and high SES schools. There was no evidence that the quality of school resources contributed to explain the school SES gap in student outcomes.

7. Is the school SES gap in student outcomes explained by the quality of teaching?

As with school quality factors, the quality of teaching was positively related to student grades. Students tended to perform better in schools where teachers were rated more positively in terms of their subject knowledge and pedagogical skills. Better teaching quality was also associated with less absenteeism. There was no evidence, however, that the quality of teaching contributed to explain the SES gap between schools.

8. Does the student SES gap vary depending on how inclusive schools are?

The level of inclusiveness in the school was positively related to student grades. But there was no evidence that the role played by school inclusiveness in student grades varied for low and high SES students.

9. Does the student SES gap vary for the level of pedagogical experience of teachers?

As with school inclusiveness, there was no evidence that the quality of teaching interacted with the family SES of students. That is, the quality of teaching was positively related to student grades but did not affect differently low and high SES students.

Taken altogether, the following conclusions/policy recommendations are provided.

1. The SES gap in student outcomes is persistent, and the factors examined in this study do not sufficiently explain this gap. The gap is apparent for student grades and post-secondary education plans. The SES gap in post-secondary education plans is not only explained by student grades. There are additional SES mechanisms explaining post-secondary education plans beyond academic skills. These mechanisms deserve the attention of policy and further research.
2. Some school factors are directly related to higher student grades. These factors include the school infrastructure, management and participation, and teaching quality. To the extent that school factors are related to student grades independently of SES, this finding emphasizes the role of education policy for promoting student outcomes. Particularly, targeted policies on school and teaching quality can contribute to improving student outcomes of low SES students and low SES schools.
3. Private tutoring helps students to achieve higher grades and aspire to pursue higher education. Private tutoring is particularly advantageous among poor families but more accessible for higher SES students. The influence of private tutoring on post-secondary

education plans is particularly strong and might reflect effects of motivation and access to information on the education and labor system in addition to academic skills. Schools can compensate for lack of private tutoring among low SES students by promoting motivation, for example, with student-oriented instruction practices and by providing career guidance in the transition from secondary to tertiary education.

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# Appendix A: Descriptive statistics

Descriptive statistics are presented for Sample 1 and Sample 2 below.

# Student outcomes

## Sample 1 and Sample 2

Table A1. Student absenteeism (ABSENT)

| Number of days | Sample 1 % | Sample 2 % |
|---|---|---|
| None | 42.28% | 31.44% |
| One | 13.18% | 16.72% |
| Two | 14.59% | 17.73% |
| Three or more | 29.95% | 34.11% |
| Total | 100.00% | 100.00% |

Table A2. Student grades (GRADES)

| Marks | Sample 1 % | Sample 2 % |
|---|---|---|
| Marks of 5, 4, 3, 2, 1, and 0 | 3.90% | 3.20% |
| Marks of 7 and 6 | 24.65% | 24.45% |
| Marks of 8 | 39.94% | 40.81% |
| Marks of 9 | 29.41% | 30.35% |
| Marks of 10 | 2.11% | 1.18% |
| Total | 100.00% | 100.00% |

Table A3. Post-secondary school aspirations (POSTSEC)

| | Sample 1 % | Sample 2 % |
|---|---|---|
| No | 32.76% | 6.25% |
| Yes | 67.24% | 93.75% |
| Total | 100.00% | 100.00% |

# Family background variables

## Sample 1

Table A4. Mother's and father's highest level of education

| Education level | Mother's | Father's |
|---|---|---|

| | education (MOMED) | education (DADED) |
|---|---|---|
| | % | % |
| Below secondary education | 0.94% | 2.11% |
| Secondary education | 34.56% | 38.30% |
| Vocational education | 31.51% | 27.22% |
| Higher education | 33.00% | 32.37% |
| Total | 100.00% | 100.00% |

Table A5. Self-perceived financial security (FINAN)

| Security level | % |
|---|---|
| Not secure at all | 6.32% |
| Rather insecure | 27.69% |
| Rather secure | 61.54% |
| Completely secure | 4.45% |
| Total | 100.00% |

Table A6. Family income and expenditure (Armenian Drams)

| Variables | Mean | SD |
|---|---|---|
| Family monthly income (INCOME) | 241,106.90 | 429,392.00 |
| Family monthly expenditure (EXPEND) | 255,888.20 | 430,012.40 |

## Sample 1 and Sample 2

Table A7. Self-perceived financial safety (FINAN)

| | Sample 1 | Sample 2 |
|---|---|---|
| Security level | % | % |
| Not secure at all | 6.32% | 0.53% |
| Rather insecure | 27.69% | 7.54% |
| Rather secure | 61.54% | 57.19% |
| Completely secure | 4.45% | 34.74% |
| Total | 100.00% | 100.00% |

Table A8. Number of computers at home (COMP)

| | Sample 1 | Sample 2 |
|---|---|---|
| | % | % |
| None | 10.69% | 5.11% |
| One | 67.47% | 61.84% |
| Two | 16.85% | 21.64% |
| Three or more | 4.99% | 11.41% |
| Total | 100.00% | 100.00% |

Table A9. Availability of Internet at home (INTER)

| | Sample 1 | Sample 2 |
|---|---|---|
| | % | % |
| Yes | 86.35% | 92.64% |
| No | 13.65% | 7.36% |
| Total | 100.00% | 100.00% |

Table A10. Private tutoring (TUTOR)

| | Sample 1 | Sample 2 |
|---|---|---|
| | % | % |
| Yes | 25.20% | 34.11% |
| No | 74.80% | 65.89% |
| Total | 100.00% | 100.00% |

# School quality variables

## Sample 1

Table A11. School quality items : Student ratings (%s)

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Very good | 19.23% | 15.05% | 36.07% | 25.94% | 35.57% | 33.58% | 30.09% | 27.33% | 25.00% | 25.14% | 36.80% |
| Good | 33.61% | 40.97% | 49.66% | 46.42% | 47.16% | 48.01% | 53.01% | 55.13% | 52.88% | 53.31% | 42.43% |
| Normal | 39.80% | 38.96% | 13.76% | 24.74% | 16.49% | 17.41% | 16.33% | 16.63% | 20.91% | 19.28% | 17.43% |
| Bad | 4.68% | 3.01% | 0.17% | 2.22% | 0.52% | 0.50% | 0.00% | 0.23% | 0.24% | 0.38% | 1.58% |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Very bad | 2.68% | 2.01% | 0.34% | 0.68% | 0.26% | 0.50% | 0.57% | 0.68% | 0.96% | 1.89% | 1.76% |
| Total | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |

### Sample 2

Table A12. School quality items: Parent ratings (%s)

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Very good | 16.22% | 12.00% | 21.02% | 24.01% | 27.41% | 25.79% | 28.60% | 21.14% | 20.57% | 17.42% | 17.50% |
| Good | 31.77% | 34.67% | 50.49% | 44.41% | 45.37% | 47.89% | 47.73% | 49.75% | 51.23% | 50.62% | 52.95% |
| Normal | 39.37% | 44.91% | 26.91% | 28.89% | 24.39% | 23.77% | 22.46% | 27.86% | 26.51% | 28.67% | 27.84% |
| Bad | 8.44% | 5.61% | 1.09% | 1.71% | 1.66% | 1.23% | 0.40% | 0.50% | 0.75% | 1.10% | 1.03% |
| Very bad | 4.19% | 2.80% | 0.49% | 0.98% | 1.17% | 1.32% | 0.81% | 0.75% | 0.94% | 2.19% | 0.66% |
| Total | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |

Note: Parents and students rated the following about the school: (1) condition of the buildings, (2) property/furniture, (3) education quality, (4) discipline, (5) financial management skills of the principal, (6) human resource policy of the principal, (7) external policy of the principal (relations with the Marz governor, village mayor), (8) work of the administrative staff, (9) activities of the school's governing board, (10) activities of the parent council, and (11) activities of the student council.

## Teaching quality

Table A14. Teaching quality (TEAQUAL)

| | Sample 1 | | | Sample 2 | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (1) | (2) | (3) |
| Very bad | 0.00% | 0.00% | 0.00% | 0.06% | 0.25% | 0.88% |
| Bad | 0.17% | 0.17% | 0.51% | 0.18% | 0.55% | 3.07% |
| Normal | 7.23% | 11.09% | 8.64% | 15.52% | 16.01% | 17.69% |
| Good | 40.84% | 45.55% | 37.80% | 50.37% | 51.23% | 48.56% |
| Very good | 51.76% | 43.19% | 53.05% | 33.87% | 31.96% | 29.80% |
| Total | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |

Note: Parents and students rated teachers according to (1) subject knowledge (2) pedagogical skills, and (3) equal treatment of students.

# Appendix B: Scale development - Further results

## School quality

### Parent responses

Correlations of school quality items were produced to examine the structure of the school quality data reported by parents (Sample 2). Results are presented in Table B1.

Table B1. School quality items (SCQUAL): Correlation matrix

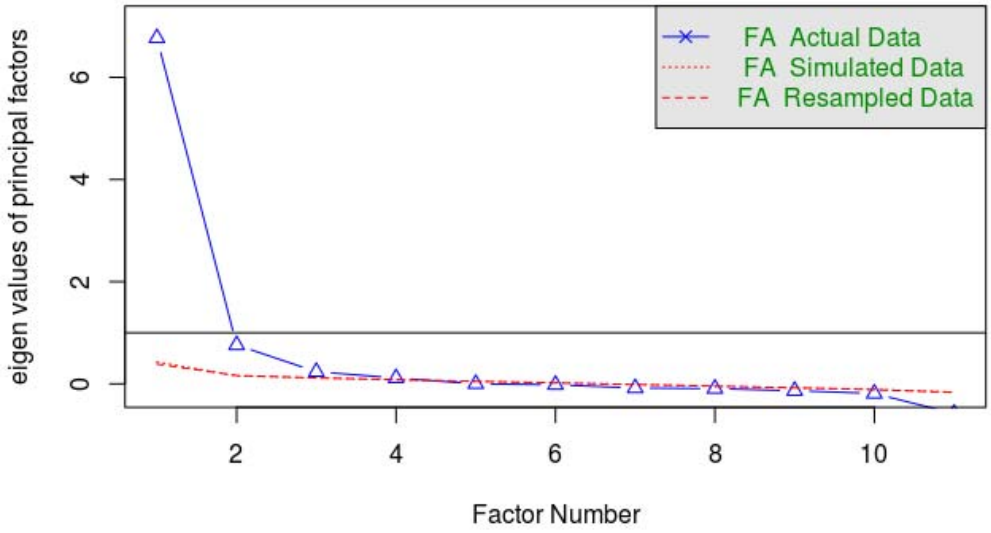
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| (1) Condition of the buildings | 1.00 | 0.82 | 0.40 | 0.44 | 0.36 | 0.34 | 0.34 | 0.30 | 0.27 | 0.30 | 0.33 |
| (2) Property/furniture | 0.82 | 1.00 | 0.51 | 0.50 | 0.42 | 0.38 | 0.37 | 0.40 | 0.37 | 0.39 | 0.38 |
| (3) Education quality | 0.40 | 0.51 | 1.00 | 0.74 | 0.66 | 0.68 | 0.62 | 0.66 | 0.63 | 0.65 | 0.59 |
| (4) Discipline | 0.44 | 0.50 | 0.74 | 1.00 | 0.68 | 0.68 | 0.59 | 0.61 | 0.62 | 0.61 | 0.58 |
| (5) Financial management skills of the principal | 0.36 | 0.42 | 0.66 | 0.68 | 1.00 | 0.85 | 0.79 | 0.78 | 0.77 | 0.72 | 0.64 |
| (6) Human resource policy of the principal | 0.34 | 0.38 | 0.68 | 0.68 | 0.85 | 1.00 | 0.83 | 0.79 | 0.76 | 0.73 | 0.67 |
| (7) External policy of the principal (relations with the Marz governor, village mayor) | 0.34 | 0.37 | 0.62 | 0.59 | 0.79 | 0.83 | 1.00 | 0.78 | 0.71 | 0.63 | 0.66 |
| (8) Work of the administrative staff | 0.30 | 0.40 | 0.66 | 0.61 | 0.78 | 0.79 | 0.78 | 1.00 | 0.78 | 0.73 | 0.70 |
| (9) Activities of the school's governing board | 0.27 | 0.37 | 0.63 | 0.62 | 0.77 | 0.76 | 0.71 | 0.78 | 1.00 | 0.79 | 0.70 |
| (10) Activities of the parent council | 0.30 | 0.39 | 0.65 | 0.61 | 0.72 | 0.73 | 0.63 | 0.73 | 0.79 | 1.00 | 0.81 |
| (11) Activities of the student council | 0.33 | 0.38 | 0.59 | 0.58 | 0.64 | 0.67 | 0.66 | 0.70 | 0.70 | 0.81 | 1.00 |

Note: Parental assessments (1=very bad, 2=bad, 3=normal, 4=good, and 5=very good)

Relatively high correlations were observed for the conditions of building, property and furniture (rho>0.8). Likewise, inter-correlations of items relating to school management (5-7), items related to participation in school (10-11) were relatively high (rho > 0.8).

Parallel analysis was performed to determine the optimal number of factors in the item data (Horn, 1965; Revelle, 2018). Results are displayed in Figure B1.

Figure B1. School quality items (SCQUAL): Parallel analysis scree plots




The blue line shows eigenvalues (i.e., variance explained) for the actual data, whereas the two red lines display eigenvalues for simulated and resampled data. The decision on the number of factors to retain is made by comparing the actual data line with the simulated data line. Factors are retained as long as eigenvalues for the observed data are larger than eigenvalues in the simulated data. The maximum number of factors is therefore 4, where the observed and simulated lines intersect. The minimum number of factors is indicated by the largest drop in the observed data line, that is, 2 factors. The results of parallel analysis indicate a solution of 2 to 4 factors.

The 2-factor solution was driven by a single factor. The 4-factor solution contained a factor predominantly explained by 'education quality' and 'discipline', which are general indicators of school quality. A solution of 3 factors was preferred. Table B2 reports loadings for the 3-factor solution.

Table B2. Parental report of school quality items: Exploratory factor analysis (factor loadings)

| | Management | Participation | Infrastructure |
|---|---|---|---|
| (1) Condition of the buildings | 0.18 | 0.09 | **0.82** |
| (2) Property/furniture | 0.19 | 0.17 | **0.94** |
| (3) Education quality | 0.57 | 0.38 | 0.36 |
| (4) Discipline | 0.58 | 0.33 | 0.36 |
| (5) Financial management skills of the principal | 0.80 | 0.36 | 0.22 |
| (6) Human resource policy of the principal | **0.85** | 0.34 | 0.18 |
| (7) External policy of the principal | **0.84** | 0.24 | 0.18 |

| | | | |
|---|---|---|---|
| (8) Work of the administrative staff | 0.74 | 0.41 | 0.20 |
| (9) Activities of the school's governing board | 0.67 | 0.54 | 0.16 |
| (10) Activities of the parent council | 0.47 | **0.84** | 0.17 |
| (11) Activities of the student council | 0.51 | **0.63** | 0.20 |

Note: The two strongest loadings for each factor are in bold.

The first factor explained 39% of variability in the item data, the second factor 20%, and the third factor 19%. Overall, the three factors explained 77% of the variability in the school quality item data. The first factors was driven by school management items, the second factor by items reflecting participation and involvement of students and parents in school, and the third factor was driven by the quality of the school infrastructure. Accordingly, factors were labelled 'management', 'participation', and 'infrastructure'. The results of factor analysis were consistent with item data correlation reported in Table B1.

## Student responses

A factor analysis was carried out with the same items from student self-reported data (Sample 1), and the same three factor solution was supported, with the three factors explaining 44%, 12% and 9% of the variability in the school quality item data, respectively. The factor scores were taken as the subscale scores of 'management', 'participation', and 'infrastructure.

Table B3: Student report of school quality items: Exploratory factor analysis (factor loadings)

| | Management | Infrastructure | Participation |
|---|---|---|---|
| (1) Condition of the buildings | 0.35 | **0.94** | 0.28 |
| (2) Property/furniture | 0.37 | **0.95** | 0.36 |
| (3) Education quality | **0.60** | 0.46 | 0.52 |
| (4) Discipline | **0.65** | 0.34 | 0.31 |
| (5) Financial management skills of the principal | **0.78** | 0.26 | 0.38 |
| (7) External policy of the principal | **0.80** | 0.25 | 0.27 |
| (8) Work of the administrative staff | **0.73** | 0.35 | 0.43 |
| (9) Activities of the school's governing board | 0.68 | 0.29 | 0.63 |
| (10) Activities of the parent council | 0.39 | 0.34 | **0.85** |
| (11) Activities of the student council | 0.38 | 0.28 | **0.86** |

## Inclusiveness of School

Responses to the three school inclusiveness-related items were subjected to a principal component analysis based on the parental and student data, respectively. All three items loaded positively on one factor, which explained 73% of the variance in the parental data and 64% of the variance in the student data. The factor loadings are presented in the Table B4 for responses of parents (Sample 2) and responses of students (Sample 1). Factor scores from this analysis were extracted to indicate inclusiveness of school. Higher scores on the factor indicate a higher level of inclusiveness.

Table B4: School inclusiveness: PCA (loadings)

| Item content | Factor loading (Students) | Factor loading (Parents) |
|---|---|---|
| (1) Provides equal opportunities for all children | 0.80 | 0.75 |
| (2) Teaches to respect human rights | 0.89 | 0.83 |
| (3) Helps get rid of stereotypes | 0.87 | 0.82 |

## Teaching quality

Teaching quality item correlations are presented in Table B5. Inter-correlations were relatively high, particularly between subject knowledge and pedagogical skills. Equal treatment of students tended to be less correlated with subject knowledge.

Table B5. Teaching quality items - parent responses: correlation matrix

| | (1) | (2) | (3) |
|---|---|---|---|
| (1) Subject knowledge | 1 | 0.82 | 0.67 |
| (2) Pedagogical skills | 0.82 | 1 | 0.74 |
| (3) Equal treatment of students | 0.67 | 0.74 | 1 |

Note: Parental assessments (1=very bad, 2=bad, 3=normal, 4=good, and 5=very good)

Given the limited number of items, it was decided to summarize the data into a single scale with PCA rather than to examine and determine the factor structure with parallel analysis and EFA.

Factor loadings of PCA results are presented in Table B6 for student (Sample 1) and parent responses (Sample 2).

Table B6. Teaching quality items (TEAQUAL): PCA factor loadings

| | Loadings (Parents) | Loadings (Students) |
|---|---|---|
| (1) Subject knowledge | 0.58 | 0.86 |
| (2) Pedagogical skills | 0.60 | 0.87 |
| (3) Equal treatment of students | 0.56 | 0.85 |

## SES scale with student data

Only three SES items were available in the student questionnaire: self-perceived financial security (FINAN), number of computers at home (COMP), and availability of Internet at home (INTER). The SES items were summarized into a single scale using principal component analysis. Item loadings are presented in Table B8.

Table B8. SES principal component analysis (loadings)

| SES items | Loadings |
|---|---|
| FINAN | 0.551 |
| COMP | 0.624 |
| INTER | 0.554 |

The derived SES variables was scaled to have a mean of zero and a standard deviation of one across the sample of students. Figure B2 and B3 display the SES distribution by region and province, respectively.

Figure B2. SES distribution by region

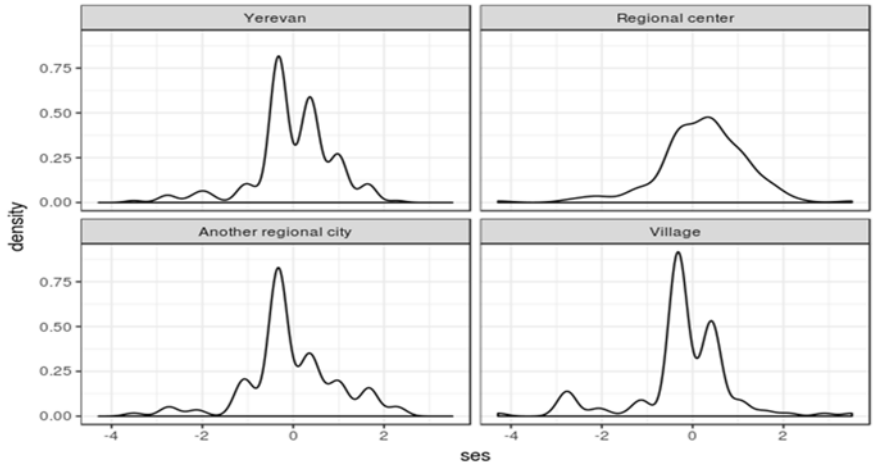



Figure B3. SES distribution by province